TITLE

<u>METHOD OF TRIGGERING APPLICATION SERVICE USING RESPONSE FILTER</u>

<u>CRITERIA AND IP MULTIMEDIA SUBSYSTEM USING THE SAME</u>

BACKGROUND OF THE INVENTION

5   **Field of the Invention**

The present invention relates to an IP multimedia subsystem, and more specifically, to use of specific Filter Criteria to trigger an application server according to the SIP response.

10 **Description of the Related Art**

Figure 1 illustrates an example of the architecture of a 3GPP (Third Generation Partnership Project) IP (Internet Protocol) multimedia subsystem. Figure 1 demonstrates a visited network 10, home network 11, and external network 12. As shown

15 in the diagram, User Equipment (UE) 101 in the visited network connects to the General Packet Radio Service (GPRS) system 102 through a 3G/UMTS communication network. There is a Proxy Call Session Control Function (P-CSCF) 103 in the visited network for communication with an Interrogating CSCF 111 (I-CSCF) and a

20 Serving CSCF (S-CSCF) 112 in the home network 11. The Home Subscriber Server (HSS) 113 stores subscriber-related information and service-related data for the S-CSCF 112, I-CSCF 111, and application servers 114. The service-related data is transparent to the HSS 113, thus the HSS 113 has some means to

25 differentiate the source of the request for the data, so it is able to respond with the requested data. The Multimedia Resource Function (MRF) 115 comprises a Multimedia Resource Function Controller (MRFC) and Multimedia Resource Function Processor

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(MRFP). The application servers can interact with the MRFC via the S-CSCF to control Multimedia Resource Function (MRF) processing. The S-CSCF 112 communicates to the application servers 114 via the IP multimedia service control (ISC)

5   interface. The application servers 114 can be Session Initiation Protocol (SIP) application servers, Open Service Access (OSA) service capability server (OSA SCS), and others. As shown in the diagram, the computer 121 and Voice over IP (VoIP) phone 122 in the external network 12 are connected to the rest

10   of the IP multimedia subsystem via the Internet.

Figure 2 illustrates an example of call setup in the 3GPP IP multimedia subsystem. An originating UE 201 sends an SIP message to the radio access network 202 of the local (either visited or home) network 20 to initiate a call with a terminating

15   UE 235. The radio access network 202 passes the request to the Serving GPRS Support Node (SGSN) 203, Gateway GPRS Support Node (GGSN) 204, and P-CSCF 205. The P-CSCF 205 then forwards the SIP message to the S-CSCF 211 of the originating home network 21. The ISC interface of the 3GP IP Multimedia Subsystem (IMS)

20   regulates a Filter Criteria (FC) mechanism. FC defines the relevant Service Point Triggers (SPTs) for each application. When the S-CSCF 211 receives the SIP message, it examines the SIP requests according to the SPTs of the FC, in order to determine where to send/proxy the SIP message. The S-CSCF 211

25   may send the SIP message to the application server 212, and after performing the service provided by the application server 212, the SIP message is forwarded to the I-CSCF 221 of the terminating home network 22. The I-CSCF 221 requests information from its HSS 222 then passes to S-CSCF 223. The S-CSCF 223 of the

30   terminating home network 22 checks the SPTs and proxies the SIP

message to the matched application server 224. The P-CSCF 231
of the network 23 is connected to receive the SIP message,
forwarded to the GGSN 232, SGSN 233, radio access network 234,
and finally to the terminating UE 235.

5   The standard FC defined by 3GPP performs filtering for
initial SIP request messages only, referred to as initial Filter
Criteria (iFC). Figure 3 illustrates the trigger mechanism for
IP multimedia service control using the iFC. The S-CSCF 31
applies iFC to determine the need to forward SIP requests to the
10   corresponding application servers when a user sends an SIP
initial request. The iFC are stored in the HSS 33 as part of
the user profile and downloaded to the S-CSCF 31 upon user
registration, or upon a terminating initial request for an
unregistered user if unavailable. The iFC represents a
15   provisioned subscription of a user to an application. The iFC
are valid throughout the registration lifetime of a user or until
the user profile is changed.

          The S-CSCF 31 first requests the relevant set of iFCs from
the HSS 33 that applies to the end user. When the S-CSCF 31
20   receives the SIP initial request, it determines whether the SIP
request matches with iFC X according to the SPTs. The SIP request
is forwarded to the first application server (AS1) 32 if it
matches with iFC X. The SIP interface 321 receives the SIP
request and executes the relevant service logic 322 according
25   to the service key iFC X. The service logic 322 of the AS1 32
may modify the SIP request, and then the SIP message is sent back
to the S-CSCF 31. The S-CSCF 31 also examines whether the SPTs
matches the iFC Y, and if they match, the SIP request is sent
to the second application server (AS2) 34. Similarly, the AS2
30   34 receives the SIP request from the SIP interface 341, executes

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the service logic 342 within AS2 34, and sends back the SIP
message to the S-CSCF 31. If no more (or none) of the iFC apply,
the S-CSCF 31 forwards this SIP request downstream based on the
route decision. In any instance, if the contact of the
5 application server fails, the S-CSCF 31 uses the "default
handling" associated with the iFC to determine if it shall either
terminate the call or let the call continue based on the
information in the iFC.

The 3GPP only defines the initial Filter Criteria (iFC)
10 triggering mechanism triggered by the SIP request, which means
all the service calls matched with iFC need to be forward to the
application servers in order to have the ability of handling the
service. However some services are activated by the SIP response
instead of the SIP request, for example, the service of call
15 forwarding on busy. The S-CSCF requires transferring the SIP
request to the application server for call forwarding on busy
even the terminating UE is not busy. The decision of triggering
these application servers cannot be determined by the SIP
request, thus sending the SIP request to these application
20 servers is unnecessary. Large amount of unnecessary SIP
messages transmitted between the S-CSCF and the application
servers wastes the resource and causes system delay.

SUMMARY OF THE INVENTION

25   Accordingly, the object of the present invention is to
reduce the number of unnecessary SIP message relay, in order to
improve the efficiency of establishing session calls.

Another object of the present invention is to simplify the operational configuration of the service-related application servers from back-to-back user agent (UA) to terminating UA.

Yet another object of the present invention is to provide
5   a flexible multimedia service control capability to the S-CSCF.

In order to achieve these objects, the present invention provides a triggering method for IP multimedia service control using response Filter Criteria (rFC). The response Filter Criteria defines a set of Service Point Triggers (SPTs) such that
10 the S-CSCF triggers an application server according to the response message. The triggering method disclosed in the present invention comprises examining a Session Initial Protocol (SIP) response message received by a Serving Call Session Control Function (S-CSCF) according to a set of response
15 Filter Criterias (rFCs), subsequently recording a corresponding SIP request message , and if the SIP response message matches the Service Point Triggers (SPTs) of one of the rFCs, then re-issuing the SIP request message to the corresponding application server designated by the matched rFC. The SPTs of
20 a rFC are defined by: SIP response codes, SIP method of the corresponding SIP request message, content of any header field or request-URI of the corresponding SIP request message, and direction of the corresponding SIP request message. The S-CSCF examines the SPTs of the rFC one by one according to their
25 indicated priority.

The present invention uses the rFC mechanism to improve the originally triggering mechanism. The rFC mechanism can coexist with the iFC (initial Filter Criteria) mechanism as these two mechanisms are compatible. The S-CSCF has the ability to disable
30 or enable the rFC mechanism, and when the rFC mechanism is

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disabled, it is the same as the standard triggering mechanism disclosed in 3GPP.

The storing location, data format, download timing, and matching manner of the rFC are identical to the iFC defined in 5   the 3GPP IP Multimedia Subsystem (IMS) IP multimedia Service Control (ISC). The rFC are stored in a Home Subscriber Server (HSS) as part of the user profile, and downloaded to the S-CSCF upon user registration.

The application server can be an SIP application server, 10   Internet Protocol (IP) Multimedia Service Switching Function (IP-SSF), Open Service Access (OSA) Service Capability Server (SCS), and etc. The present invention is applied when the application servers are selected depending on the SIP response message, for examples when the call receiver is busy, 15   unreachable or not found, or when the call setup is failed.

The present invention also provides an IP multimedia subsystem to perform the triggering method, wherein the IP multimedia subsystem comprises an S-CSCF, application server, and HSS. The S-CSCF receives and checks the SIP response 20   message, and forwards the corresponding SIP request message to the application server if the SIP response message matches the SPTs of the rFC. The rFC are stored in the HSS, and downloaded to the S-CSCF for matching.

BRIEF DESCRIPTION OF THE DRAWINGS

25   The present invention can be more fully understood by reading the subsequent detailed description in conjunction with the examples and references made to the accompanying drawings, wherein:

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Fig. 1 illustrates the network configuration of the 3GPP
IP multimedia subsystem;

Fig. 2 illustrates the call setup procedures in the 3GPP
IP multimedia subsystem;

5   Fig. 3 illustrates the application triggering architecture
according to the initial Filter Criteria (iFC) scheme;

Fig. 4a illustrates an SIP message flow chart in the
situation of call forwarding to a voice mail when the terminating
UE (UE2) is busy (rFC scheme not involved);

10   Fig. 4b illustrates an SIP message flow chart in the
situation of call forwarding to a voice mail when the terminating
UE (UE2) is busy (rFC scheme involved);

Fig. 5 illustrates the UML model of the service point of
trigger (SPT) in the response Filter Criteria (rFC).

15   **DETAILED DESCRIPTION OF THE INVENTION**

The following description is based on an example of call
forwarding.

Figures 4a and 4b illustrate the SIP message flowing chart
in the case of call forwarding to a voice mail when the
20   terminating UE (UE2) is busy. Figure 4a shows the IP multimedia
subsystem without the rFC scheme, whereas Figure 4b shows the
IP multimedia subsystem with the rFC scheme disclosed in the
present invention.

As shown in Figure 4a, the originating user equipment (UE1)
25   201 originates an SIP invite message according to the standard
3GPP IMS to request a call establishment with the terminating
user equipment (UE2) 235. The SIP invite message passes from
UE1 201 to the P-CSCF 205 and S-CSCF 211 of UE1's home network
21, then further passes to the I-CSCF 221 and HSS 222 of UE2's

home network 22.   HSS 222 then sends back the location information of the UE2 235 to the I-CSCF 221, so the I-CSCF 221 is able to pass the SIP invite message to the S-CSCF 223 of UE2's home network 22.   The S-CSCF 223 checks the SIP invite message

5   with the iFC, and forwards the SIP invite message to an application server (AS) 224a once the SIP invite message matches the iFC.   Accordingly, the AS 224a tries to establish a call to UE2 235 via the S-CSCF 223 and P-CSCF 231.   Unfortunately, UE2 235 is busy at the moment, thus it responds an SIP response

10   message of "486 busy here" to the AS 224a via the same path.   The AS 224a establishes a call to a Voice Mail (VM) server 224b if the user profile of UE2 235 includes a voice mail service.   The VM server 224b replies an SIP response message of "200 OK" to the AS 224a to agree the call setup between UE1 201 and the VM

15   server 224b.   Notice that the VM server 224b is also an application server, but it is a terminating application rather than a back-to-back application server.

Figure 4b illustrates the same situation as shown in Figure 4a, thus the message flowing procedures are identical until the

20   S-CSCF 423 of UE2's home network 42 receives the SIP invite message from the I-CSCF 421.   The S-CSCF 423 forwards the SIP invite message to UE2 435 via the P-CSCF 431 without going through the AS 424a.   UE2 435 is currently busy, and therefore the S-CSCF 423 receives an SIP response message of "486 busy

25   here" via the P-CSCF 431.   The S-CSCF 423 sends an invite message to the VM server 424b as the SIP response message "486 busy here" matches the Service Point Triggers (SPTs) of the rFC.   The VM server 424b responds with "200 OK" to the S-CSCF 423 to initiate setting up the communication between UE1 401 and the VM server

30   424b.

While comparing Figures 4a and 4b, the IP multimedia subsystem requires less exchange of SIP messages if employing the rFC scheme for triggering the application servers according to the SIP response messages. By reducing the total number of

5   SIP messages flowing between entities, the efficiency of call setup is improved thereof. The load of the application servers is also reduced, as the application servers of prior art perform back-to-back service, whereas most application servers are just terminating application servers if the rFC scheme of the present

10   invention is used. The terminating application servers do not require the ability of message determination and transferring, and there are less traffic flowing to the terminating application servers.

The S-CSCF downloads the rFC from the HSS, and the service

15   point of triggers (SPTs) is illustrated using the UML model shown in Figure 5. The SPTs are defined by SIP response code, SIP method of the corresponding SIP request message, content of the header field or request URI of the corresponding SIP request message, and the direction of the corresponding SIP request

20   message.

The rFC scheme can be employed with the original iFC scheme simultaneously to enhance the triggering mechanism for IP multimedia service control. The S-CSCF becomes more flexible because both the SIP request message and the SIP response message

25   may trigger the services provided by the application servers.

When implementing the triggering method of the present invention, the S-CSCF requires the ability of processing the rFC, and the HSS requires additional rFC data, so it can be downloaded to the S-CSCF upon request. The FC data is stored

as XML script format, wherein SML script has the characteristic of self-describable, thus it is easy to extend.

Finally, while the invention has been described by way of example and in terms of the above, it is to be understood that
5   the invention is not limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications and similar arrangements as would be apparent to those skilled in the art. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such
10 modifications and similar arrangements.